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BreezeMAX™PRO-S CPE

Installation & Maintenance Manual

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Disposal of Electronic and Electrical Waste

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About This Manual

The purpose of this manual is to guide the installing engineer in the installation of the BreezeMAX PRO-S CPE. The manual provides detailed instructions on installing and maintaining the PRO-S CPE unit.

The manual comprises the following chapters:

- Chapter 1 - Introduction: Provides an overview of the BreezeMAX PRO-S CPE components and their specifications.
- Chapter 2 - Preparations and Precautions - Provides detailed safety guidelines, ESD precautions and lightning protection.
- Chapter 3 - Planning the installation site - Provides guidelines for preparing the installation site, including guidelines on positioning the ODU, physical and environmental requirements, cooling requirements, and electrical requirements. This chapter also lists the tools and materials required for installation.
- Chapter 4 - Inspecting and Unpacking - Describes the items shipped with the PRO-S CPE unit.
- Chapter 5 - Mechanical Installation - Provides step-by-step instructions for mounting the PRO-S CPE ODU and antenna on a pole.
- Chapter 6 - Connecting the Cables - Describes how to connect the antenna cable, the IDU-ODU Cable and the grounding cable, and how to seal the connectors.
- Chapter 7 - Connecting to Power - Describes the recommended procedure for connecting the PRO-S CPE IDU to the power.
- Chapter 8 - SU Alignment Unit (SAU) - Describes how to connect the SAU to the PRO-S CPE ODU for antenna alignment purposes.
- Chapter 9 - Connecting to the Network and PC - Describes how to connect the PRO-S CPE unit to the network/PC.

- Chapter 10 - Commissioning Procedure - Describes the basic configuration required to operate the PRO-S CPE. The chapter also describes the antenna alignment procedure.

- Chapter 11 - Maintenance & Troubleshooting - Provides instructions for ODU and antenna maintenance and refers to the BreezeMAX Troubleshooting Guide.

- Appendix A - CPE Site Report - Provides a recommended CPE site report format to be filled out by the installer.

- Glossary

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Chapter 1 - Introduction

In This Chapter:

- "General" on page 2
- "Product Specifications" on page 5

1.1 General

The WiMAX-ready PRO-S CPE is a Subscriber Unit (SU) that is powered by Intel's WiMAX Connection 2250.

The PRO-S CPE, installed at the customer premises, comprises an Outdoor Unit (ODU) and an Indoor Unit (IDU).

The ODU includes the modem, radio, data processing and management components of the SU. It also includes an integral high-gain flat antenna (SA models) or a connection to an external antenna (SE models), as described in Table 1-2. "L" (Limited Performance) models of the CPEs support a limited overall throughput of 2 Mbps maximum. These L-models can be upgraded to support maximum throughput through a suitable license. The ODU provides data connections to the Base Station, providing bridge functionality and supporting up to 512 MAC addresses. It connects connects to the IDU and to the user's equipment through a 10/100BaseT Ethernet port.

BreezeMAX CPEs support dual operation modes, enabling in future releases detection of the protocol used in the wireless link (APD) and automatic switching between FDD and TDD operation modes (not applicable to CPEs in bands where only a single operation mode is supported, such as the 2.3 and 2.5 GHz bands).

Table 1-1: CPEs Frequencies

Band	TDD Frequencies	FDD Frequencies
2.3 GHz	2300 - 2360 MHz (2305 - 2360 MHz in Si CPE)	Not Applicable
2.5 GHz	2496 - 2690 MHz	Not Applicable
3.3 GHz (PRO-S only)	3300 - 3400 MHz	Uplink: 3366 - 3400 MHz Downlink: 3316 - 3350 MHz (Duplex Separation: 50 MHz)
3.5 GHz	3399.5 - 3600 MHz	Uplink: 3399.5 - 3500 MHz Downlink: 3499.5 - 3600 MHz (Duplex Separation: -100 MHz)

Table 1-2: PRO-S CPE ODU Types

ODU Type	Description
BMAX-CPE-ODU-PRO-SA-x.x	Subscriber Outdoor Unit with an integrated vertical/horizontal polarization antenna.

Table 1-2: PRO-S CPE ODU Types

ODU Type	Description
BMAX-CPE-ODU-PRO-SE-x.x	Subscriber Outdoor Unit with a connection to an external antenna.
BMAX-CPE-ODU-PRO-L-SA-x.x	Subscriber Outdoor Unit with an integrated vertical/horizontal polarization antenna. The unit's total throughput is limited to 2 Mbps maximum.
BMAX-CPE-ODU-PRO-L-SE-x.x	Subscriber Outdoor Unit with a connection to an external antenna. The unit's total throughput is limited to 2 Mbps maximum.

* x.x indicates the radio band: 2.3, 2.5 or 3.5

The indoor unit is powered from the mains and connects to the ODU via a Category 5E Ethernet cable carrying the Ethernet data between the two units, as well as power (-54 VDC) and control signals to the ODU and status indications from the ODU.

There are three types indoor units:

- The BMAX-CPE-IDU-1D is the basic IDU, functioning as a simple power supply and interface unit with a 10/100BaseT Ethernet port that connects to the user's equipment.
- The IDU-NG-4D1W Wireless Networking Gateway IDU provides advanced routing capabilities and can also serve as a Wireless LAN Access Point.
- The IDU-1D1V and IDU-1D2V SIP Voice Gateway IDUs provide one or two telephony ports and include a backup battery to ensure uninterrupted service during power outages. The IDU-1D1V and IDU-1D2V are available with either RJ-11 or Terminal Board telephone connection(s).

Configuration and performance monitoring of the SU can be performed using any of the following options:

- Remotely through the Base Station,, where the Base Station is managed using either the Monitor program or SNMP.
- Locally via the Ethernet port, using Telnet to access the Installer Monitor program.
- Using a PC/Notebook or a PDA/Pocket PC with an http browser to access the built-in web configuration server.

To facilitate the configuration process, antenna alignment and performance monitoring during installation/testing, a special Y-cable is available. This enables connecting a Notebook or a PDA directly to the ODU for fast and easy completion of all the necessary operations.

A miniature SU Alignment Unit (SAU), that includes signal strength and status indicators, is also available to support easy and convenient antenna alignment and status verification.

1.2 Product Specifications

1.2.1 Radio

Table 1-3: PRO-S CPE Radio Specifications

Item	Description		
Frequency	Band	TDD Frequencies (MHz)	FDD Frequencies (MHz)
	2.3 GHz	2300-2360	Not Applicable
	2.5 GHz g	2496-2690	Not Applicable
	3.3 GHz	3300 - 3400	Uplink: 3366-3400 Downlink: 3316-3350
	3.5 GHz	3399.5-3600	Uplink: 3399.5-3500 Downlink: 3499.5-3600
Operation Mode	■ TDD, Half Duplex ■ FDD, Half duplex (3.x GHz band only)		
Channel Bandwidth	■ 1.75 MHz (only in FDD mode in the 3.x GHz bands) ■ 3.5 MHz ■ 5 MHz (only in TDD mode)		
Central Frequency Resolution	0.125 MHz		
Antenna Port (PRO-SE CPEs)	N-Type, 50 Ohm		
2.3 GHz Integral Antenna (PRO-SA CPE)	14 dBi typical, 33°AZ x 27°EL, vertical/horizontal polarization, compliant with RoHS and EN 301 525, V1.1.1 (2000-06).		
2.5 GHz Integral Antenna (PRO-SA CPE)	14 dBi typical, 33°AZ x 27°EL, vertical/horizontal polarization, compliant with RoHS and EN 301 525, V1.1.1 (2000-06).		
3.x GHz Integral Antenna (PRO-SA CPE)	16.5 dBi typical (16 dBi in the 3.3-3.4 GHz band), 20°AZ x 20°EL, vertical/horizontal polarization, compliant with RoHS and EN 302 085, V1.2.2 (2003-08) Range 1		
Max. Input Power (at antenna port)	-20 dBm before saturation 0 dBm before damage		
Output Power (at antenna port)	19 dBm +/-1 dB maximum ATPC Dynamic range: 45 dB		
Modulation	Downlink: OFDM; Uplink: OFDMA-16 BPSK, QPSK, QAM16, QAM64		
FEC	Convolutional Coding: 1/2, 2/3, 3/4		

1.2.2 IDU/ODU Communication

Table 1-4: PRO-S CPE IDU/ODU Communication

Item	Description
Cable Type	Category 5E, Outdoor Data Cable, Double Jacket, 4x2x24# FTP
Maximum Length	90 meter

1.2.3 Data Communication (Ethernet Port)

Table 1-5: PRO-S CPE Data Communication (Ethernet Port)

Item	Description
Standard Compliance	IEEE 802.3 CSMA/CD
Maximum Packet Size (including 4 CRC bytes)	1550 Bytes
Speed	10/100 Mbps, Half/Full Duplex with Auto Negotiation

1.2.4 Configuration and Management

Table 1-6: PRO-S CPE Configuration and Management

Item	Description
Local Management/via Ethernet Port	■ Telnet ■ Built-in web configuration server (using PC or PDA with http browser)
Remote Management	Via the Base Station
Software upgrade	■ Using TFTP via the Base Station ■ Using TFTP via Ethernet port
Configuration upload/download	■ Using TFTP via the Base Station ■ Using TFTP via Ethernet port

1.2.5 Environmental

Table 1-7: PRO-S CPE Environmental Specifications

Type	Unit	Details
Operating temperature	PRO-S CPE ODU	-40°C to 55°C
	PRO-S CPE IDU	0°C to 40°C
Operating humidity	Outdoor units	5%-95% non condensing, Weather protected
	Indoor equipment	5%-95% non condensing

1.2.6 Standards Compliance, General

Table 1-8: PRO-S CPE Standards Compliance, General

Type	Standard
EMC	■ ETSI EN 301 489-1/4 ■ FCC part 15 Subpart B
Safety	■ EN 60950-1 (CE) ■ UL 60950 (US) ■ AS/NZS 3260 (Australia / New Zealand)
Environmental	ETS 300 019: ■ Part 2-1 T 1.2 & part 2-2 T 2.3 for indoor & outdoor ■ Part 2-3 T 3.2 for indoor ■ Part 2-4 T 4.1E for outdoor
Radio	■ ETSI EN 301 021 V.1.6.1 ■ ETSI EN 301 753 V.1.2.1

1.2.7 Physical and Electrical

1.2.7.1 Mechanical

Table 1-9: PRO-S CPE Mechanical Specifications

Unit	Dimensions (cm)	Weight (kg)
CPE-IDU-1D	14 x 6.6 x 3.5	0.3
CPE-ODU-PRO-SA	21 x 21 x 5.4	1.25
CPE-ODU-PRO-SE	21 x 21 x 5.4	1.13

1.2.7.2 Electrical

Table 1-10: PRO-S CPE Electrical Specifications

Item	
Power Consumption (IDU+ODU)	2.x GHz units: 25W 3.x GHz units: 22W
ODU Power Consumption	16.5W
CPE-IDU Power Input	100-240 VAC, 47-63 Hz
CPE-ODU-PRO Power Input	54 VDC from the IDU over the indoor-outdoor Ethernet cable

1.2.7.3 Connectors

Table 1-11: PRO-S CPE Connectors

Unit	Connector	Description
CPE-IDU-1D	ETHERNET	10/100Base-T (RJ-45).Cable connection to a PC: StraightCable connection to a hub: Crossed
	RADIO	10/100Base-T (RJ-45)
	AC IN	3 pin AC power plug
CPE-ODU-PRO-SA/SE	IDU COM	10/100Base-T (RJ-45)
	SAU	Special mini USB
	ANT (SE model)	N-Type jack, 50 ohm, lightning protected

1.2.7.4 LEDs

Table 1-12: CPE-IDU-1D LEDs

Name	Description	Functionality
POWER (3)	Power Indication	■ Off - IDU is not powered or power failed ■ Green - IDU power is OK
ETH (2)	Ethernet link status (Ethernet integrity)	■ Off - No Ethernet connectivity has been detected between the outdoor unit and the device connected to the indoor unit's data port ■ Green - Ethernet connectivity has been detected between the outdoor unit and the device connected to the indoor unit's data port
WIRELESS (1)	Wireless link status	■ Off - SU is not associated with a Base Station ■ Green - SU is connected with a Base Station (network entry completed) ■ Blinking Green - Authentication failed

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Chapter 2 - Preparations and Precautions

In This Chapter:

- "Lightning Protection Guidelines" on page 12

2.1 Lightning Protection Guidelines

This paragraph provides information for the installation of an effective grounding and suppression system, for the protection of Alvarion's products against lightning. For a list of required accessories, see Table 3-4.

NOTE

In case of contradiction between this paragraph and the standard requirements of the country in which the equipment is installed, the more stringent of the standards will always apply.

In case of contradiction between this paragraph and installation instructions provided elsewhere by Alvarion, refer to the full version of the Lightning Protection document. The full version of the document can be downloaded from Alvarion's web site www.alvarion.com. It is recommended to check for updates of this document from time to time.

This section deals primarily with the grounding of the equipment being installed. It is not concerned with grounding against lightning or the grounding of buildings. The main role of a Grounding System is to minimize lightning damage.

IMPORTANT

Alvarion does not provide any warranties as to the effectiveness of the suggested measures. The implementation of the suggested measures is at the customer's own discretion. Under no circumstances will Alvarion be liable for any consequences resulting from the implementation or lack of implementation of the suggested measures.

The Grounding System must be maintained and checked periodically in accordance with local regulations.

2.1.1 Lightning Protection Principles

Lightning protection for Alvarion Outdoor Units (ODU) installed outdoors on towers or poles, is provided by ensuring minimum pickup of lightning induced transients, and by the suppression of transient voltages at the input and output terminals of both the Indoor and Outdoor units.

Minimizing the pickup of induced voltages is accomplished by isolating the Outdoor Units and cables from the lightning down current, and through the use of shielded cables with peripheral shield grounding.

The outdoor unit and Antenna are connected mechanically to the pole, which is in turn grounded in accordance with the requirements of most safety standards, therefore the Outdoor Units are grounded as well.

2.2 Lightning Protection System Components

The components of a typical Lightning Protection System (LPS) are as follows:

- Air Terminal
- Down Conductor
- Outdoor Units Grounding
- Earth Termination System
- Lightning Protectors

For further lightning protection guidelines and principles, refer to "Alvarion Lightning Protection" white paper (www.alvarion.com -> Customer Service area -> "White papers and Technology Tutorials" section.

For details on grounding the ODU, see Section 6.3.

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Chapter 3 - Planning the Installation Site

In This Chapter:

- "Guidelines for Positioning the ODU and Antenna" on page 16
- "IDU-ODU Cables" on page 17
- "Environmental Specification" on page 18
- "Tools" on page 19

Before unpacking, you will need to select a suitable installation site. Choose a site that supports the physical characteristics of the unit and is in accordance with the unit's environmental and power requirements.

CAUTION

ONLY experienced installation professionals who are familiar with local building and safety codes and, wherever applicable, are licensed by the appropriate government regulatory authorities should install outdoor units and antennas.

Failure to do so may void the BreezeMAX product warranty and may expose the end user or Service Provider to legal and financial liabilities. Alvarion and its resellers or distributors are not liable for injury, damage or regulation violations associated with the installation of Outdoor Units or antennas.

3.1 Guidelines for Positioning the ODU and Antenna

This section provides key guidelines for selecting the optimal installation locations for the ODU.

CAUTION

ONLY experienced installation professionals who are familiar with local building and safety codes and, wherever applicable, are licensed by the appropriate government regulatory authorities should install outdoor units and antennas.

Failure to do so may void the BreezeMAX product warranty and may expose the end user or Service Provider to legal and financial liabilities. Alvarion and its resellers or distributors are not liable for injury, damage or regulation violations associated with the installation of Outdoor Units or antennas.

Select the optimal locations for the equipment using the following guidelines:

- The ODU should be mounted on a 1"-4" pole. Its location should enable easy access to the unit and its connectors for installation and testing.
- The higher the placement of the antenna, the better the achievable link quality.
- The antenna should be installed to provide a direct, or near line of sight with the Base Station antenna. The antenna should be aligned to face the general direction of the Base Station.
- In some cases it might be necessary to up/down-tilt the antenna. An optional Tilt accessory for the ODU providing a tilt range of +/-15 is available from Alvarion. The tilt option might be necessary to either improve the link conditions or, if the SU is too close to the Base Station, to reduce the receive signals strength. As a rule of thumb, if the SU is located at a distance of less than 300 meters from the Base Station, it is recommended to up-tilt the antenna by approximately 10° to 15° (especially in line-of-sight conditions) to avoid saturation of the receivers by too strong signals.
- Outdoor units with a connection to an external antenna should be installed as close as possible to the antenna.

3.2 IDU-ODU Cables

NOTE

The length of the Indoor-to-Outdoor cable should not exceed 90 meters. The length of the Indoor to Outdoor cable, together with the length of the Ethernet cable connecting the CPE IDU 1D to the data equipment, should not exceed 100 meters.

Use only Category 5E Ethernet cables from either Alvarion or any of the approved manufacturers, listed in Table 3-1. Consult with Alvarion's specialists on the suitability of other cables.

Table 3-1: Approved Category 5E Ethernet Cables

Manufacturer	Part Number
Superior Cables Ltd. www.cvalim.co.il	612098
HES Cabling Systems www.hescs.com	H5E-00481
Teldor www.teldor.com	8393204101
Southbay Holdings Limited 11th Fl., 15, Lane 347, Jong Jeng Rd. Shin Juang City, Taipei County Taiwan, R.O.C. Attn: Eva Lin Tel. 886-2-2832 3339 Fax. 886-2-2206 0081 E-mail: eva@south-bay.com.tw	TSM2404A0D

In case of missing information in the manufacturer's web site (product specifications, ordering issues, etc.), it is highly recommended to contact the manufacturer's sales representative directly.

3.3 Environmental Specification

Table 3-2: Environmental Specifications

Type	Unit	Details
Operating temperature	Outdoor units	-40°C to 55°C
	Indoor equipment	0°C to 40°C
Operating humidity	Outdoor units	5%-95% non condensing, Weather protected.
	Indoor equipment	5%-95% non condensing, Weather protected.
Storage/Transportation temperature	Outdoor and Indoor units	-40°C to +70°C
Storage/Transportation humidity	Outdoor and Indoor units	5%-95% non-condensing

3.4 Tools

The following table lists the recommended tools and sealing materials required for installation.

Table 3-3: Recommended Tools and Sealing Materials

Tool	Description
Spanners	■ ¼" ■ M3 ■ M8
Flat screwdriver	5.0 x 100
Crimpers	■ For N-type connectors (antenna connector) ■ RJ-45 connector (CPE, IDU-ODU)
Cable stripping tool	
Cutting tools	Cutter, knife, scissors, etc.
Materials	
Strips	Plastic cable tie for outdoor use. Minimum width: 4.8 mm Minimum thickness: 1.3 mm
Isolation material	High quality sealing material such as Scotchfil™ Electrical Insulation Putty from 3M (or equivalent) over-wrapped with either Super 33+ or Super 88 vinyl Electrical Tape (or equivalent) to ensure IP-65 compliant protection against dust and water.
Connectors	RJ-45 connectors shielded
Eth. Cable	Category 5E Ethernet cable (8-wire, 24 AWG)
Measurement Tools	
Cable tester	■ For testing the cables with CAT5 connectors ■ For testing Category 5E Ethernet cable (8-wire, 24 AWG)

The following table lists the accessories required for lightning protection. These accessories can be ordered from Alvarion.

Table 3-4: Lightning Protectors and Part Numbers

	Lightning Protector Description	Part Number
1	Earth Termination	Alvarion: 872935
2	Protector for Antenna Port ONLY! 2300-2600MHz signals	Alvarion: 872905
3	Baseband protection. F Manufacturer: Transtector Systems IncTel: (1) 208.772.8515 800.882.9110(US only) http://www.transtector.com/peripherals/alvarion/index.html	Transtector Model: ALPU-ALVR

In case of missing information in the manufacturer's web site, it is highly recommended to contact the manufacturer's sales representative directly.

4

Chapter 4 - Installation

In This Chapter:

- "Preliminaries" on page 22
- "PRO-S CPE IDU" on page 23
- "PRO-S CPE ODU" on page 24
- "Tilt Accessory (Optional)" on page 27

4.1 Preliminaries

Examine the shipping container for damage. If you notice any damage, notify the carrier that delivered the unit immediately and enter a service call in Alvarion's SSM (www.alvarion.com > Customer Support area).

Check the items that have been sent against this manual. If any items are missing, notify your Alvarion agent immediately.

4.2 PRO-S CPE IDU

Remove the packing material without damaging it.

The following figure lists the items shipped with the PRO-S CPE Indoor Unit.

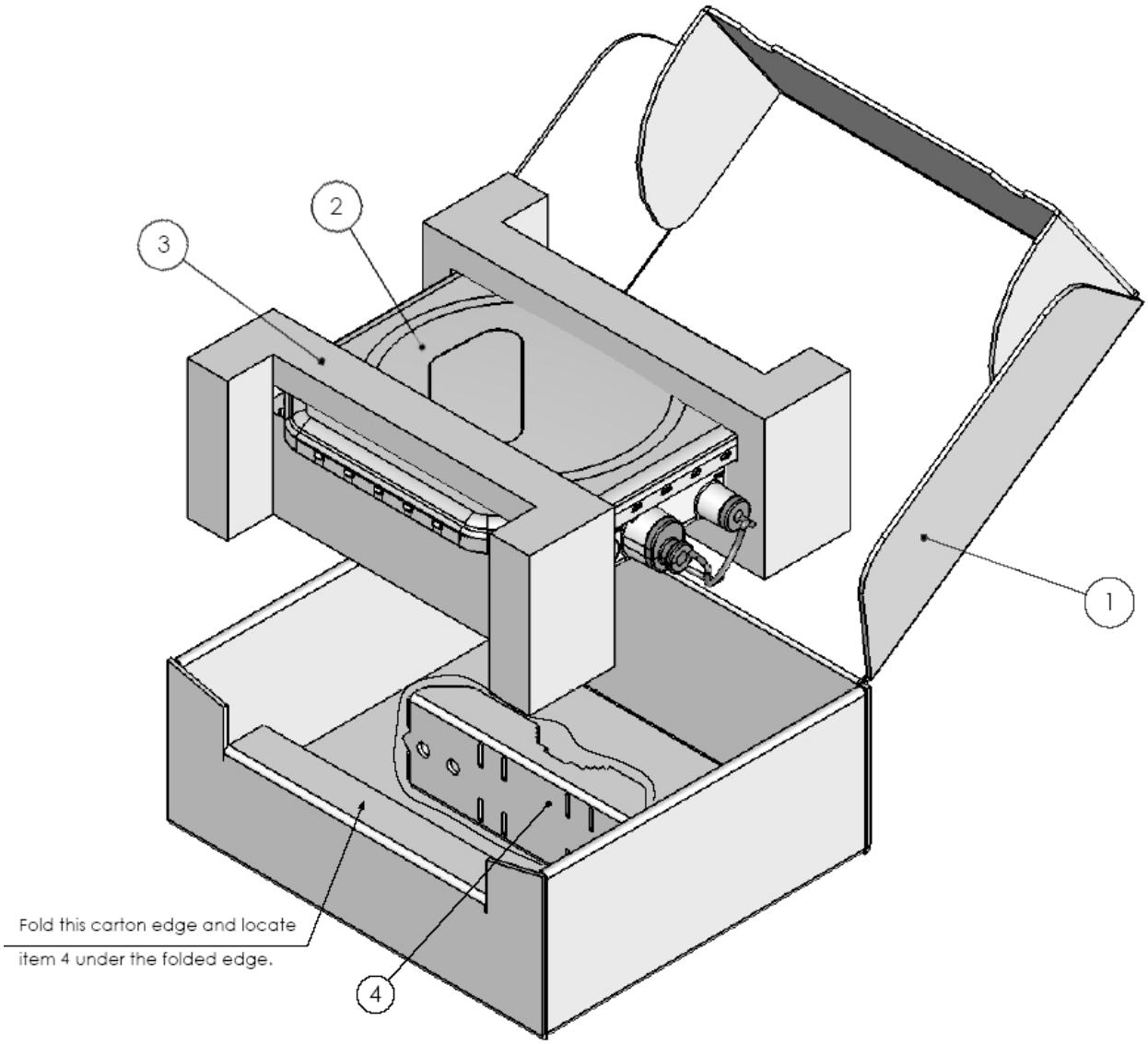
- BMAX-CPE-IDU-1D
- Wall mounting kit
- Mains power cord

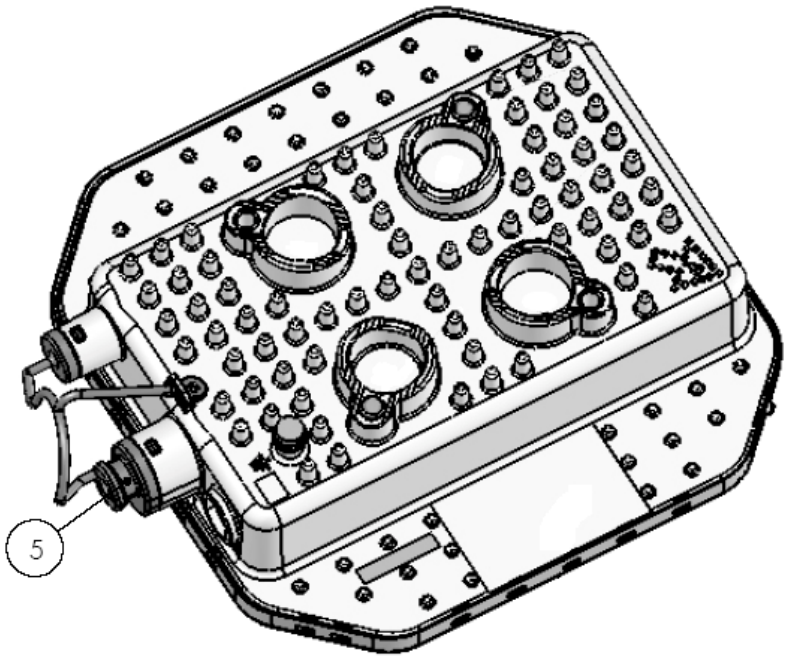
4.3 PRO-S CPE ODU

Confirm that the ODU is upright before taking it out of the box.

Remove the packing material without damaging it.

The following figure lists the items shipped with the PRO-S CPE ODU.





1 - Cardboard box

2 - PRO-S CPE ODU

3 - Packing material

4 - Pole Mounting Kit (see Table 4-1).

5 - Lower cover + 2 plastic plugs

6 - Quick Installation Guide (placed on the unit) - not in picture)

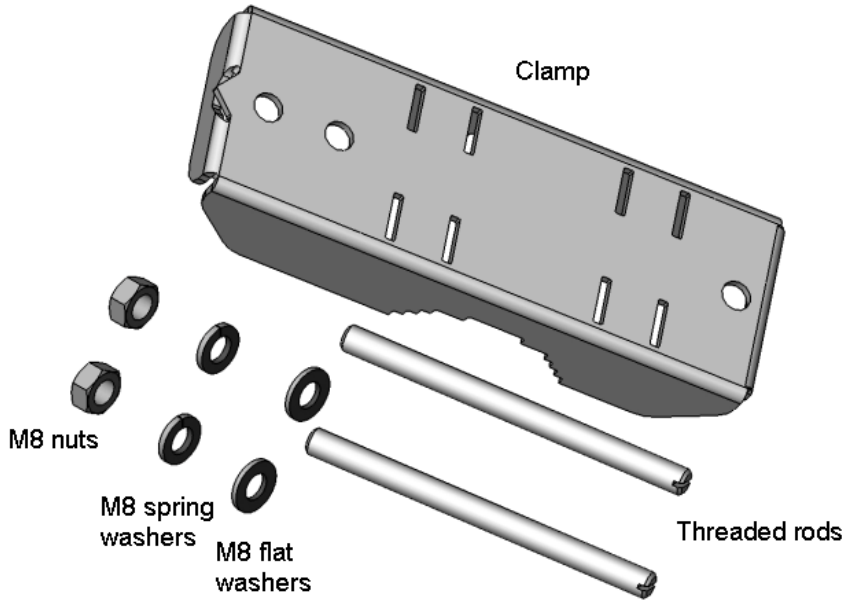


Table 4-1: Pole Mounting Kit

Component	Description	Qty
Clamp	Mounting clamp	1
Threaded rods	M8 x 150 mm	2
Nuts	M8	2
Flat washers	M8	2
Spring washers	M8	2

4.4 Tilt Accessory (Optional)

Confirm that all items listed in the following table have been shipped with the tilt accessory.

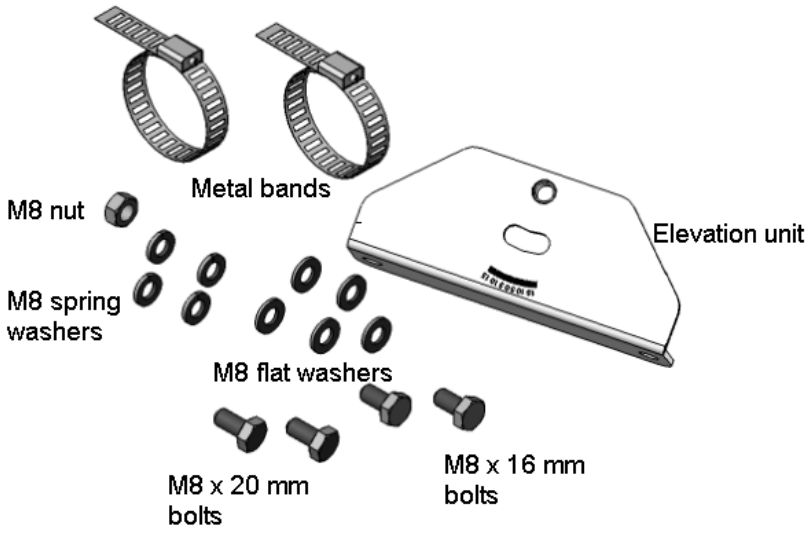


Table 4-2: Tilt Accessory Kit

Component	Description	Qty
Elevation unit	±15 deg	1
Metal Bands	14 mm stainless steel	2
Bolts	M8 x 20 mm	2
Bolts	M8 x 16 mm	2
Flat washers	M8	4
Spring washers	M8	4
Nut	M8	1

5

Chapter 5 - Mechanical Installation

In This Chapter:

- "Installing the ODU" on page 30
- "Mounting the Antenna" on page 38
- "Installing the IDU" on page 39

This chapter describes the procedures involved in installing the CPE on site (general antenna alignment procedure).

5.1 Installing the ODU

The ODU installation consists of the following steps:

1. On-ground preparation of the ODU
2. Mounting the ODU on a pole

Before beginning, make sure you have the following items available:

- Any of the following ODUs specified in Table 1-2.
- ODU pole mounting kit
- Indoor-Outdoor cable - Ethernet cable with two shielded RJ-45 connectors.
- Grounding cable with an appropriate termination.

Installation tools and material (see Section 3.4).

5.1.1 Preparing the ODU

Prepare the ODU for mounting. Using a flat screwdriver, fasten the two M8 threaded rods to the trappings on the back side of the ODU according to the required polarization. See Figure 5-1 and Figure 5-2.

Use the Polarization Indication Arrow to determine the polarization of ODUs with an integrated antenna. When the arrow points upward (Figure 5-1), this indicates Vertical polarization. When the arrow points to the right (Figure 5-2), this indication Horizontal polarization.

Make sure the connectors are facing downward.

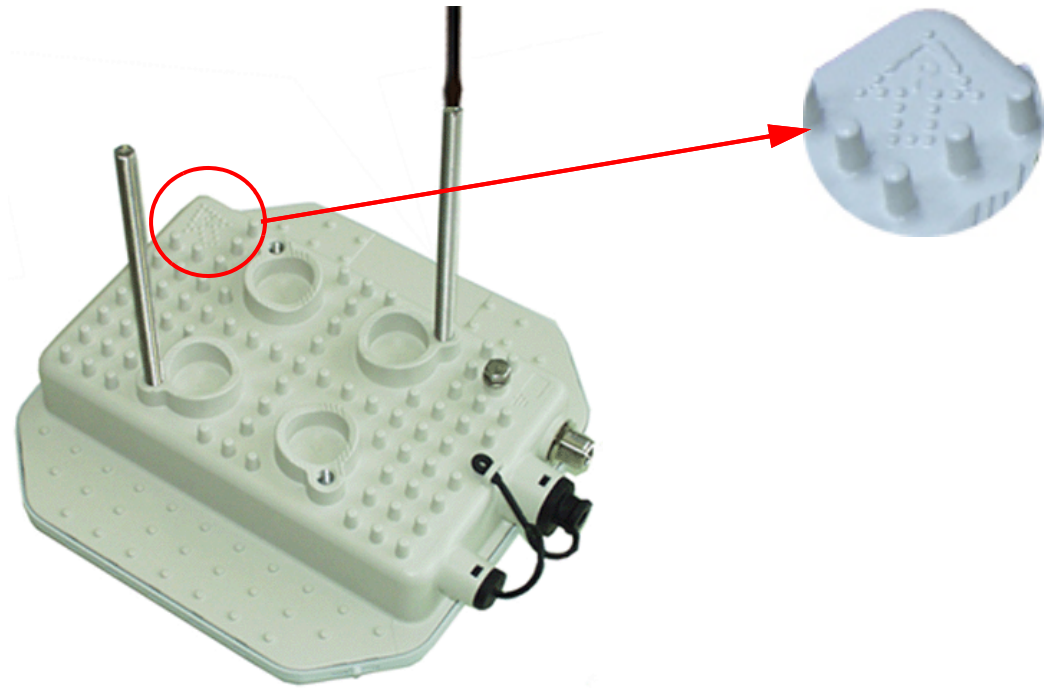


Figure 5-1: Vertical Polarization

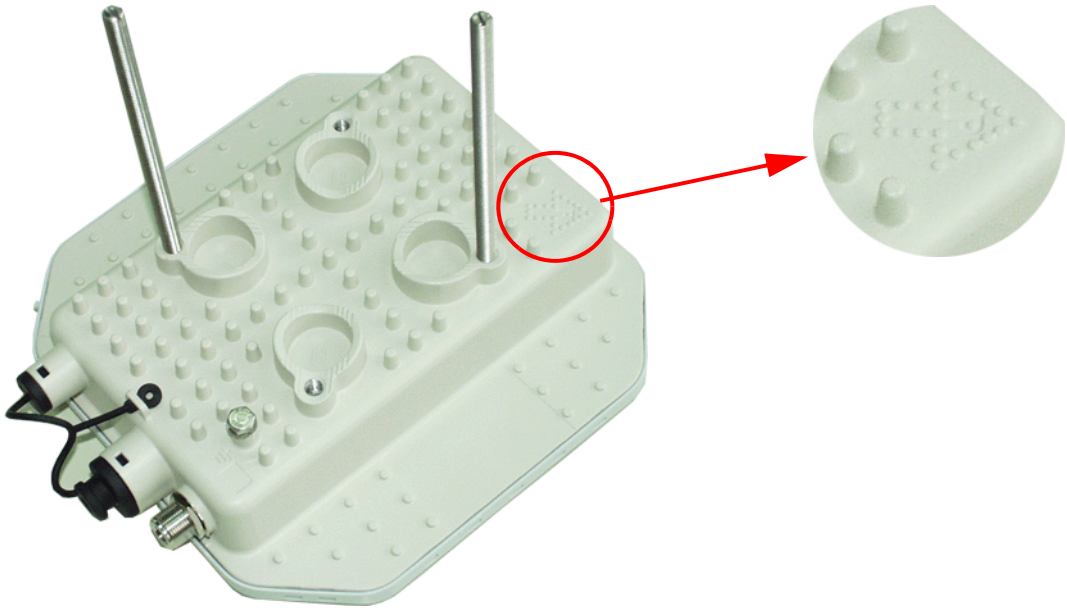


Figure 5-2: Horizontal Polarization

5.1.2 Mounting the ODU on a Pole Using a Clamp

1. When mounting an ODU with an integrated antenna, lean the ODU on the pole according to the required polarization. Pay attention to the Polarization Indication Arrow on the casing.

   OR

   When mounting an ODU with an external antenna, lean the ODU on the pole such that the connectors are facing downward (the ODU's polarization is not relevant).

2. Thread the clamp on the two studs (concave side toward the pole).
3. Use two M8 nuts, washers and spring washers to secure the ODU to the pole.

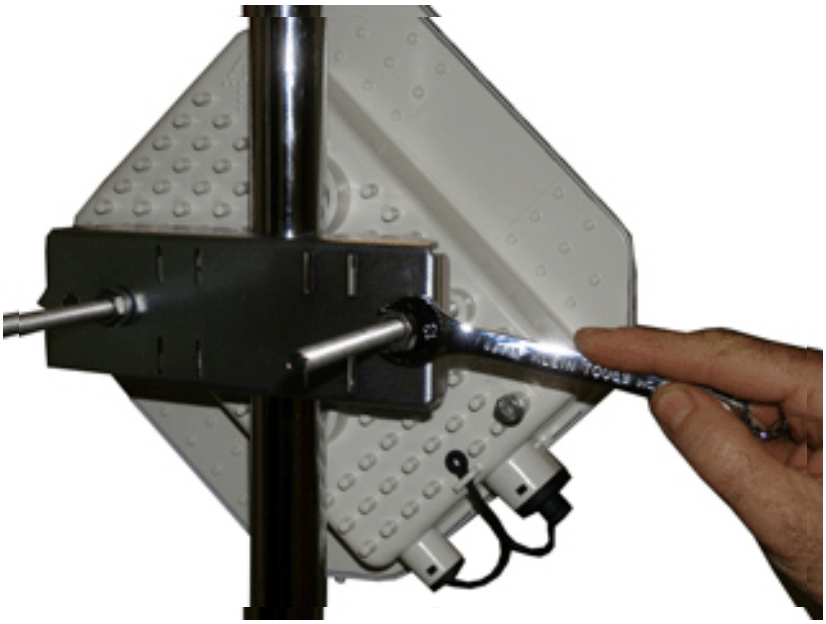


Figure 5-3: Securing the ODU to the Pole

4. Fasten the 2 nuts to firmly secure the ODU to the pole. Apply torque 9 [N*m] (78 [lbs*in]).

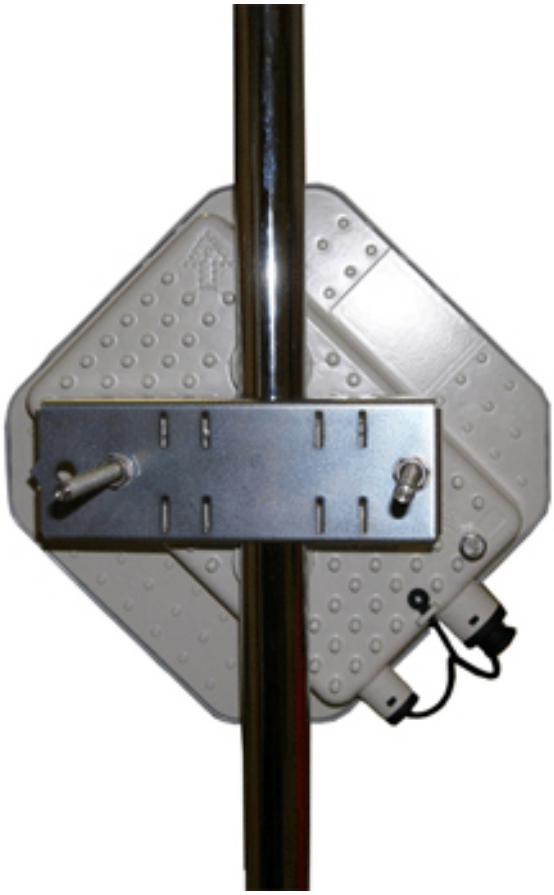


Figure 5-4: ODU Assembled on a Pole

5.1.3 Mounting the ODU on a Pole Using the Tilt Accessory (Optional)

IMPORTANT

The tilt accessory is relevant for ODUs with an integrated antenna only.

1 Thread the M8x20 mm bolt through the clamp and Elevation unit hole with the fixed nut. Use a washer and spring washer.

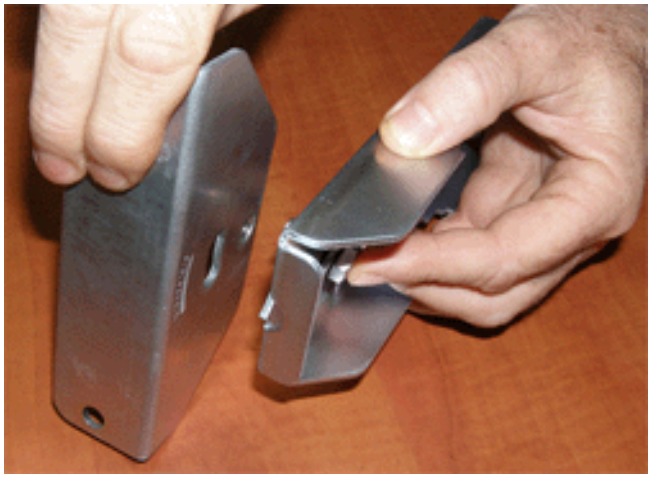


Figure 5-5: Assembling the Clamp and Elevation Unit - 1

2 Thread the elevation bolt through the slide hole of the clamp. Use a spring washer and flat washer on one side and a flat washer and nut on the other side. Do not tighten yet.

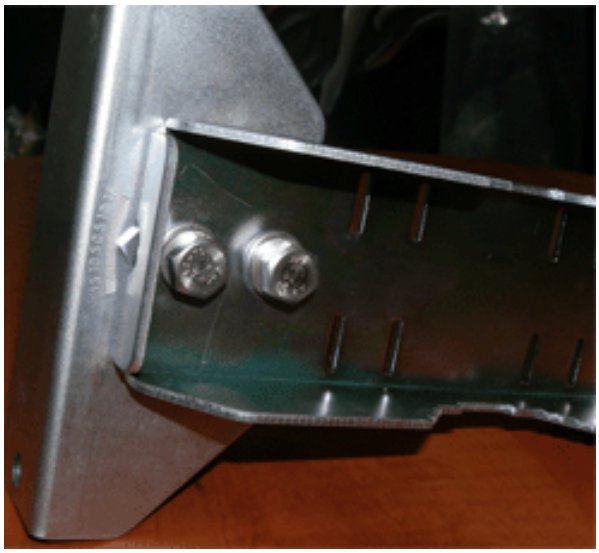


Figure 5-6: Assembling the Clamp and Elevation Unit - 2

3 Position the assembled elevation unit on the ODU according to the required polarization. Pay attention to the Polarization Indication Arrow on the casing.

4 Fasten the two M8x16 mm bolts using spring washers and flat washers. Apply torque 9 [N*m] (78 [lbs*in]).

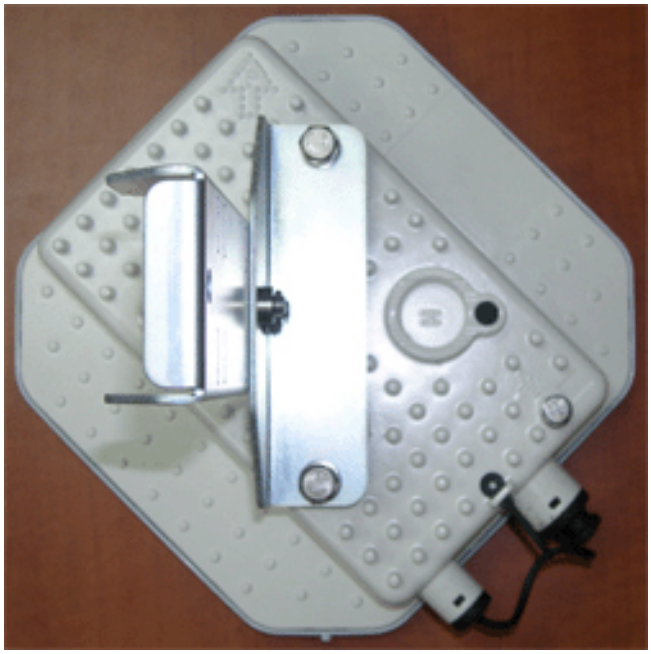


Figure 5-7: Assembling the Elevation Unit and ODU

5 Thread the two metal bands onto the clamp, according to the pole size as follows:

- For a pole size up to 2", use the two inner holes
- For a pole size of 2"-4", use the two outer holes

Refer to the following diagram:

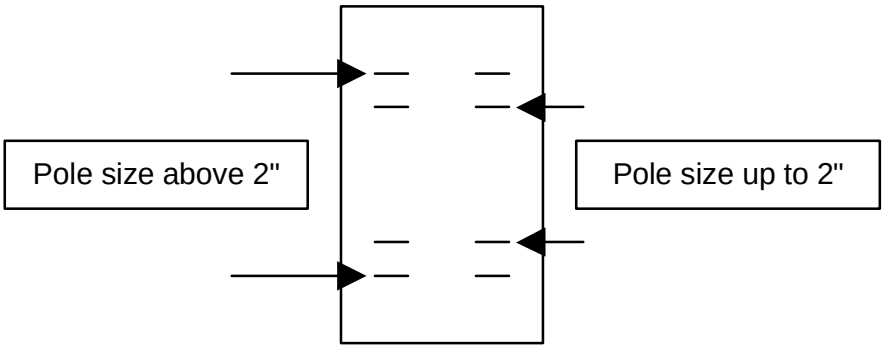


Figure 5-8: Metal Bands Threading Diagram

IMPORTANT

The maximum width of the metal band is 14 mm.

Figure 5-9: Threading the Metal Bands

6 Lean the ODU on the pole and insert the metal bands to the lockers. Using a flat screwdriver, fasten the screw of each of the metal bands to firmly secure the ODU to the pole.

Figure 5-10: RFU with Elevation Unit Assembled on Pole

7 To secure the metal bands, thread any excess band into the hole.

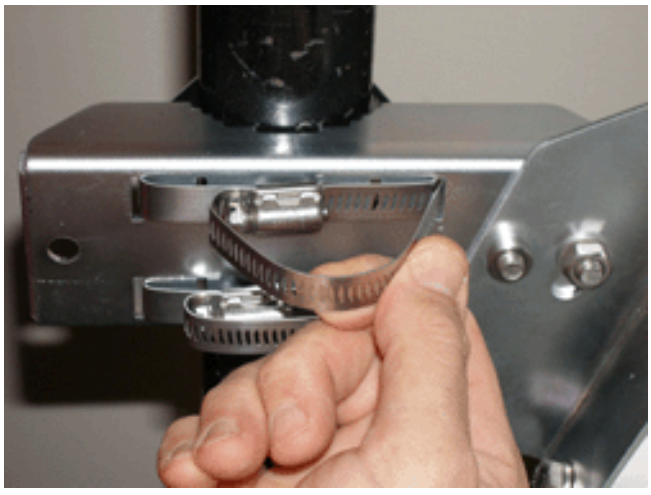


Figure 5-11: Threading Excess Band

8 Use the elevation scale on the elevation unit to adjust the elevation angle of the antenna based on the radio planning guidelines.

9 Fasten the elevation bolt. Apply torque 9 [N*m] (78 [lbs*in]).

5.2 Mounting the Antenna

To mount the antenna, follow the manufacturer's installation guidelines provided with the antenna kit.

For antenna positioning guidelines, refer to Section 3.1.

5.3 Installing the IDU

The unit can be placed on a desktop or a shelf. Alternatively, it may be wall mounted using the mounting kit and guidelines supplied with the unit.

6

Chapter 6 - Connecting the Cables

In This Chapter:

- "Connecting the Antenna Cable" on page 42
- "Connecting the IDU-ODU Ethernet Cable" on page 44
- "Connecting the Grounding Cable" on page 49
- "Sealing the Outdoor Connectors" on page 51

6.1 Connecting the Antenna Cable

To connect the RF cable (units with external antenna):

1 Connect the right angle N-Type male connector of the coaxial RF cable to the antenna. Use a spanner to fasten gently. Apply torque of 31 [N*m] (275 [Lbf*in]).

2 Connect the other end of the RF cable to the N-Type connector (marked) located on the bottom panel of the unit and fasten gently. Apply torque of 31 [N*m] (275 [Lbf*in]).

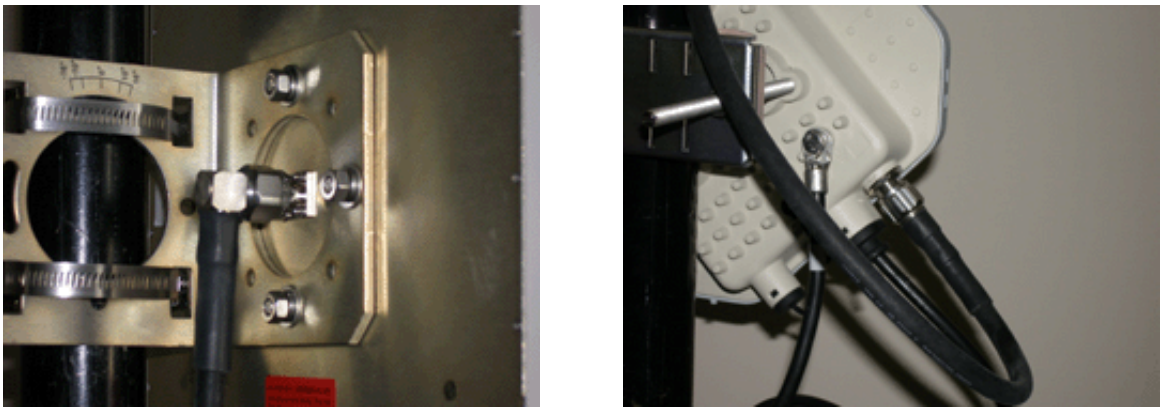


Figure 6-1: Connecting the Antenna Cable

3 Fix the antenna cable onto the pole using a cable strip.

   a Use additional cable strips to route the cable such that water can accumulate on the cable bends, away from the unit.

   b When routing the cable, do not exceed the minimum bending radius in the cable specifications.

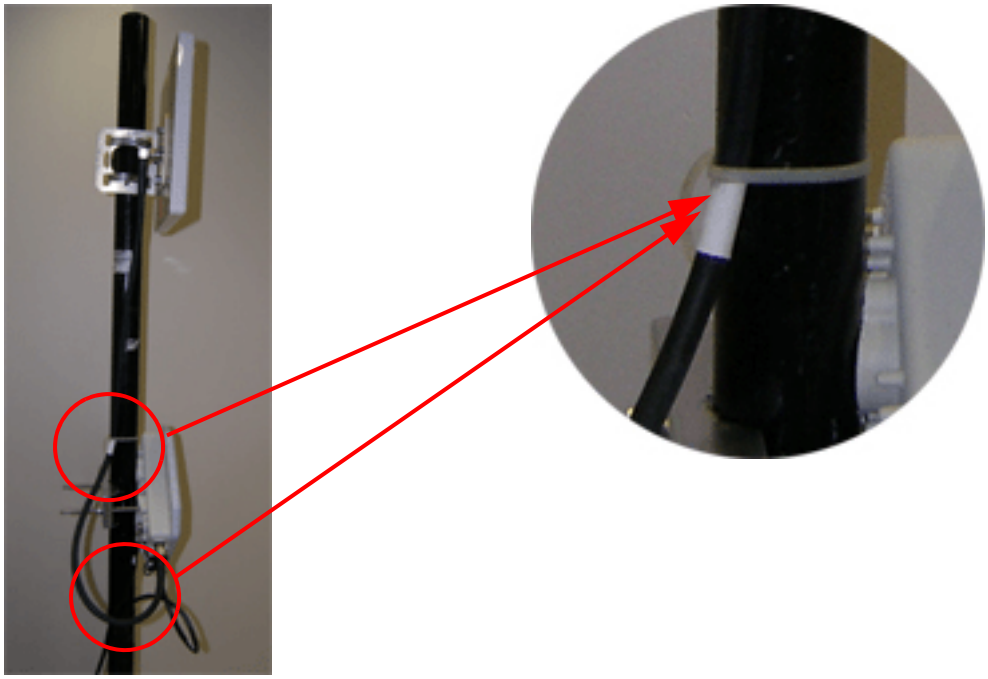


Figure 6-2: Fixing the Antenna Cable onto the Pole

The antenna RF connectors should be properly sealed to protect against rain and moisture (refer to Section 6.4).

6.2 Connecting the IDU-ODU Ethernet Cable

Use only Category 5E Ethernet 4x2x24# FTP outdoor cables with two shielded RJ-45 connectors from either Alvarion or any of the approved manufacturers, listed below. Consult with Alvarion's specialists on the suitability of other cables.

Table 6-1: Approved Category 5E Ethernet Cables

Manufacturer	Part Number
Superior Cables Ltd. www.cvalim.co.il	612098
HES Cabling Systems www.hescs.com	H5E-00481
Teldor www.teldor.com	8393204101
Southbay Holdings Limited 11th Fl., 15, Lane 347, Jong Jeng Rd. Shin Juang City, Taipei County Taiwan, R.O.C. Attn: Eva Lin Tel. 886-2-2832 3339 Fax. 886-2-2206 0081 E-mail: eva@south-bay.com.tw	TSM2404A0D

In case of missing information in the manufacturer's web site, it is highly recommended to contact the manufacturer's sales representative directly.

To connect the IDU-ODU cable:

1. Remove the sealing cap of the IDU COM connector. If you have an Ethernet cable with an already assembled RJ-45 connector, go to step 4. Otherwise, continue to step 2.
2. Insert one end of the Ethernet cable through the hole in the sealing cap.
3. Insert and crimp an RJ-45 connector on the cable. Use a crimp tool for RJ-45 connectors to prepare the wires, insert them into the appropriate pins and use the crimp tool to crimp the connector. Make sure to do the following:
   - ◇ Remove as small a length as possible of the external jacket. Verify that the external jacket will be well inside the sealing cover when connected to the unit, to ensure good sealing.

- Take back the shield drain wire before inserting the cable into the RJ-45 connector, to ensure a good connection with the connector's shield after crimping.

The IDU-ODU cable provides pin-to-pin connection on both ends.

The following figure shows the required wire pair connections.

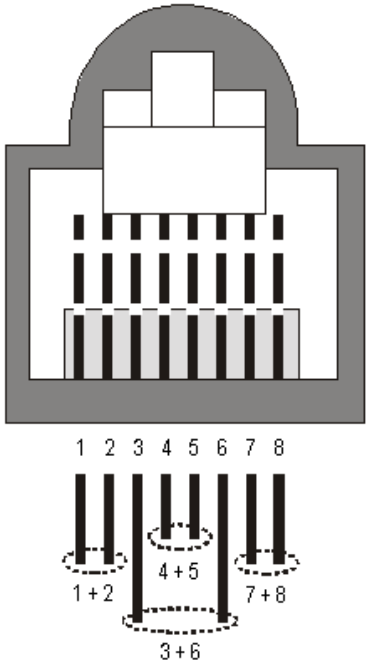


Figure 6-3: Ethernet Connector Pin Assignments

The color codes used in the standard cables supplied by Alvarion are as listed in the following table:

Table 6-2: Cable Color Codes

Wire color	Pin
Blue	1
Blue/white	2
Orange	3
Orange/white	6
Brown	4
Brown/white	5
Green	7
Green/white	8

4 Connect the Ethernet cable to the IDU COM RJ-45 connector.

5 Cut the wire connected to the sealing cap.

6 The sealing cap has a special cut allowing to insert an ethernet cable with an already assembled RJ-45 connector through the cap. To expose the cut, squeeze lightly the cap. Carefully insert the cable with the assembled connector through the cut.

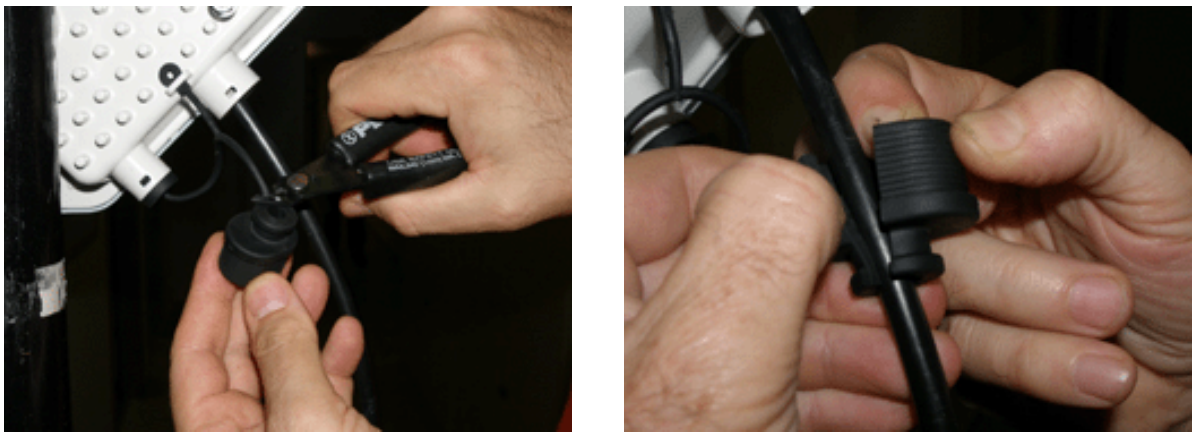


Figure 6-4: IDU-ODU Cable Sealing Cap

7 Insert the sealing cap to ensure protection against moisture. Make sure that the small protrusion on the side of the cap fits inside the hole on the connector's protective body.

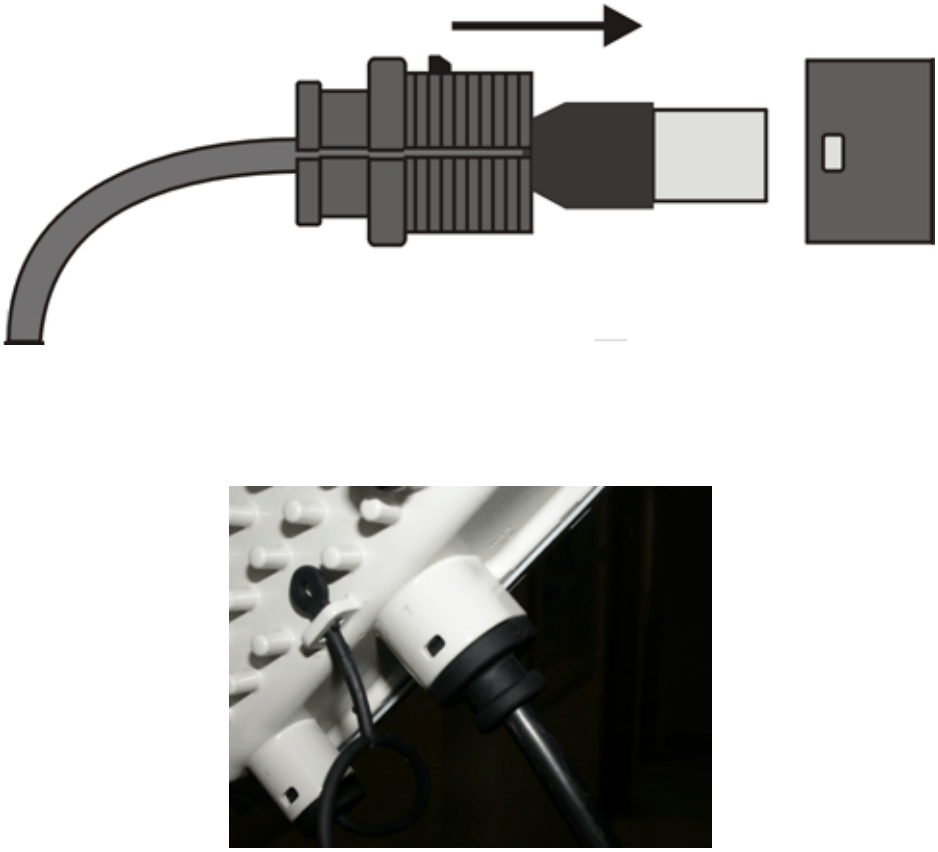


Figure 6-5: Inserting the IDU COM connector and Sealing Cap

8 Route the cable to the location selected for the indoor equipment. Fix the Cat.5E Ethernet (IDU-ODU) cable onto the pole using a cable strip.

9 Assemble an RJ-45 connector with a protective cover on the indoor end of the IDU-ODU cable. Refer to the pin assignment and color codes in standard cables described above.

NOTE

The length of the Indoor-to-Outdoor cable should not exceed 90 meters. The length of the Indoor-to-Outdoor cable, together with the length of the Ethernet cable connecting the CPE-IDU-1D to the data equipment, should not exceed 100 meters.

10 Connect the IDU-ODU cable to the RADIO connector. The RADIO connector in the CPE-IDU-1D is located on the front panel as shown in Figure 6-6.

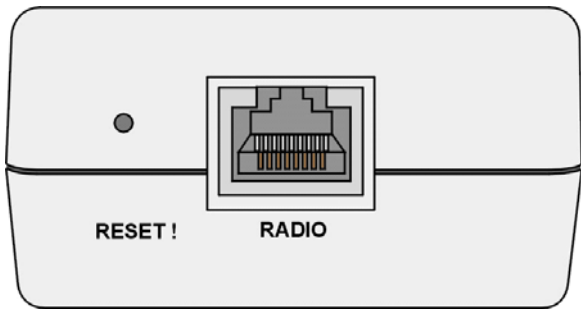


Figure 6-6: CPE-IDU-1D Front Panel

CAUTION

Do not connect the data equipment to the RADIO port. The RADIO port supplies DC power to the ODU, and this may harm other equipment connected to it.

6.3 Connecting the Grounding Cable

When grounding Alvarion Outdoor Radio Units, use the GND (ground) screw on the unit as a grounding point.

The shield (outside conductor) of the 16-mm² coaxial cable must be connected to the Outdoor Unit chassis ground via the coax connector at the top, and to ground on entering the building/shelter.

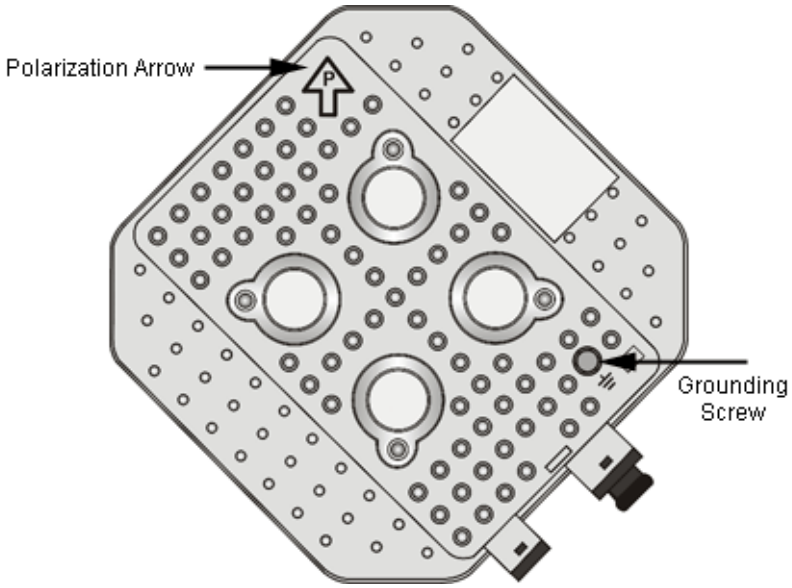


Figure 6-7: PRO-S CPE ODU Grounding Point

To connect the grounding cable:

1 Connect the grounding cable to the grounding screw (marked ⏚) located on the rear panel of the ODU and firmly tighten the grounding screw (see Figure 6-7). Apply torque 6.4 [N*m] (55.3 [lbs*in]).

Figure 6-8: Connecting the Grounding Cable to the ODU

NOTE

- Use cable strips in order to attach all cables to the pole.
- Do not pull the cable, avoid stretching it. Leave enough cable length between the strip and the connection on both sides of the cable.

2 Connect the other end of the grounding cable to a good ground (earth) connection.

For information on lightning protection, see Section 2.1.

6.4 Sealing the Outdoor Connectors

All outdoor connectors (N-Type RF connector, Ethernet RJ-45, and SA-U) should be properly sealed to protect against rain and moisture.

To seal the connectors:

Use high quality sealing material such as Scotchfil™ Electrical Insulation Putty from 3M (or equivalent) over-wrapped with either Super 33+ or Super 88 vinyl Electrical Tape (or equivalent) to ensure IP-65 compliant protection against dust and water.

NOTE

- The N-Type connector of the ODU must be closed without using any tool, only by hand.
- The outdoor connectors should be tightened using sleeves.
- When routing the coaxial cable, leave a service loop at the antenna so there will sufficient length of coaxial cable to replace a faulty connector, when necessary.
- Secure the coaxial cable so that there is no mechanical stress at the antenna connection. Follow the superstructure with the coaxial cable to its base to the building.
- If the coaxial cable requires suspension from the ODU to the building, use a stranded wire to support the coaxial cable weight. (The support will prevent a migration of the coaxial cable's inner conductor to the shield).

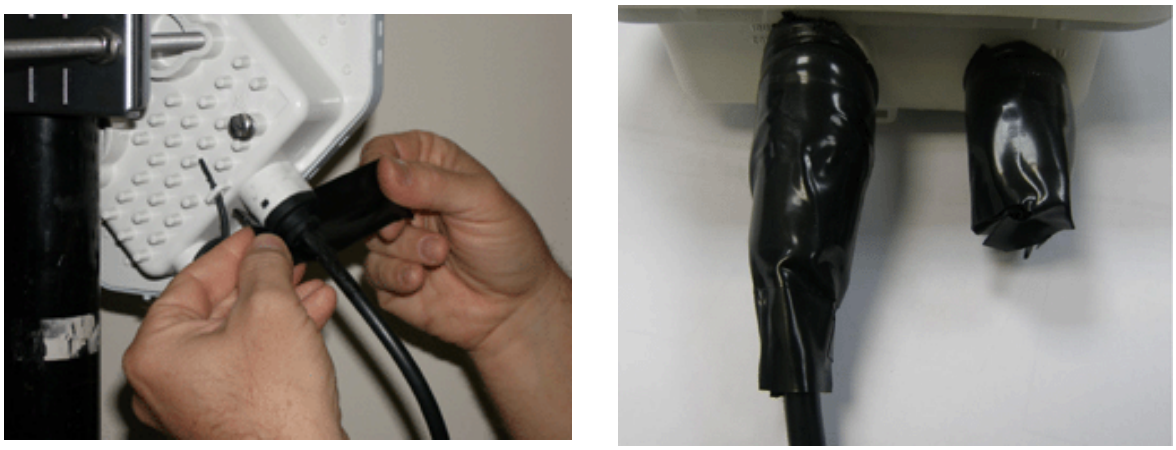


Figure 6-9: Sealing the Outdoor Connectors

7

Chapter 7 - Connecting to Power

In This Chapter:

- "Connecting the Power Cable" on page 54

7.1 Connecting the Power Cable

To connect the power cable:

1 Connect the power cord to the unit's AC socket, located on the rear panel. Connect the other end of the power cord to the AC mains after verifying that the unit is rated for the voltage in the country of use; the AC range is indicated on the back side of the CPE-IDU-1D.

NOTE

The color codes of the power cable are as follows:

Brown	Phase	~
Blue	Neutral	0
Yellow/Green	Ground	⏚

2 Verify that the POWER LED located on the front panel is lit, indicating that the unit is supplying power to the radio port.

3 Configure the basic parameters and align the antenna as described in Section 10.2.

4 Connect the 10/100 Base-T ETHERNET connector(s) to the data equipment. The cable connection should be a crossed Ethernet if connecting to a hub/switch and a straight cable if connecting directly to a PC Network Interface Card (NIC).

NOTE

The length of the Ethernet cable connecting CPE-IDU-1D to the user's equipment, together with the length of the IDU-ODU cable, should not exceed 100 meters.

5 Verify proper operation as described in Section 10.4.

8

Chapter 8 - SU Alignment Unit (SAU)

In This Chapter:

- “General” on page 56
- “Using SAU for Antenna Alignment” on page 60
- “Operation Verification” on page 61

8.1 General

The miniature SU Alignment Unit can be used during installation and testing to support an easy process of antenna alignment and provide the ODU's status indications.

To connect the SAU to the ODU:

1. Remove the sealing cap of the ODU's SAU connector.
2. Connect the cable attached to the SAU to the SAU connector.

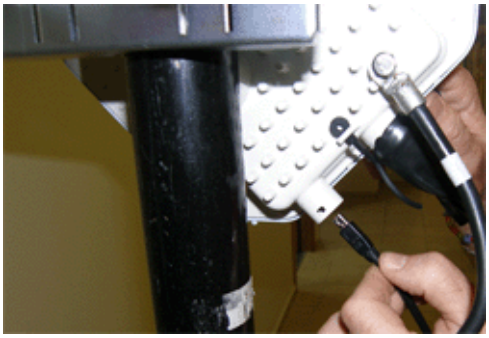


Figure 8-1: Connecting the SAU Cable

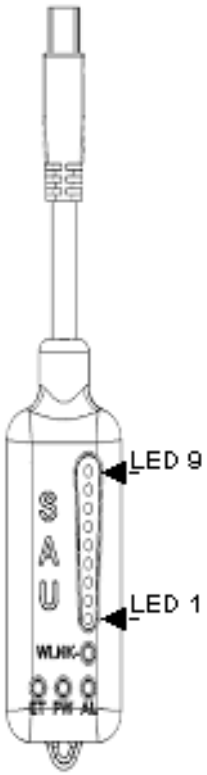


Figure 8-2: SAU Front Panel

Table 8-1: SAU LEDs

Name	Description	Functionality
AL	Alarm indication	■ Off - ODU is OK, diagnostic test passed ■ Red - ODU failure
PW	Power indication	■ Off - ODU is not powered or 3.3 VDC failure ■ Green - ODU power to SAU is OK
ET	Ethernet link status indication (Ethernet integrity)	■ Off - No Ethernet connectivity has been detected between the outdoor unit and the device connected to the indoor unit's Ethernet port ■ Green- Ethernet connectivity has been detected between the outdoor unit and the device connected to the indoor unit's Ethernet port

Table 8-1: SAU LEDs

Name	Description	Functionality
WLNK	Wireless link status indication	■ Off - The SU is not connected with a Base Station ■ Orange on - The SU is connected with and receives services from the Base Station (Network Entry completed). Link Quality is indicated by LEDs 1-9 as described in Table 8-2. below. ■ Blinking orange - Authentication failed. The reason is provided by Link Quality Bar LEDs: If LEDs 6, 7 and 8 are on: Authentication reject by RADIUS server. If LEDS 7 and 8 are on: Rejected by Base Station (Duplicate SU Name in database). If LED 8 is on: Authentication Timeout, re-authentication failure (connection to RADIUS server lost or Shared Secret mismatch)

* After power-up of the ODU, the all LEDs illuminate until self-test has completed.

Table 8-2: SAU LINK QUALITY LEDs Functionality

Bar LEDs	SNR
LED 1 (green) is On	5dB ≤ SNR < 10dB
LEDs 1-2 (green) are On	10dB ≤ SNR < 15dB
LEDs1-3 (green) are On	15dB ≤ SNR < 20dB
LEDs 1-4 (green) are On	20dB ≤ SNR < 24dB
LEDs 1-5 (green) are On	SNR ≥ 24dB and RSSI < -75dBm
LEDs 1-6 (green) are On	SNR ≥ 24dB and RSSI ≥ -75dBm
LEDs 1-7 (green) are On	SNR ≥ 24dB and RSSI ≥ -70dBm
LEDs 1-8 (green) are On	SNR ≥ 24dB and RSSI ≥ -60dBm
LEDs 1-8 (green) and 9 (red) are On	RSSI ≥ -20dBm (saturation)
LEDs 1 - 8 Blinking one after the other	During full frequency scan

Table 8-2: SAU LINK QUALITY LEDs Functionality

Bar LEDs	SNR
LEDs 1 - 9 Blinking as follows: LED 5 lights, after 200ms LEDs 4 & 6 light, after 200ms LEDs 3&7 light, after 200ms LEDs 2&8 light, after 200ms LEDs 1 lights, after 200ms all the LEDs are extinguished and then the sequence is repeated.	During Best AU selection process or short scan

3 After completing the installation, disconnect the cable and replace the cap as shown in the following figure. Make sure that the small protrusion on the side of the cap fits inside the hole on the connector's protective body:

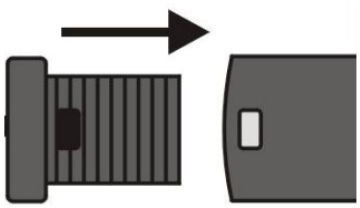


Figure 8-3: Inserting the SAU Sealing Cap

4 Isolate the SAU cap as well to protect the connection against moisture and humidity (refer to Section 6.4 and Table 3-3).

8.2 Using SAU for Antenna Alignment

The LINK QUALITY bar display on the SAU comprises 10 LEDs:

- LED 1 (WLNK) indicates that the wireless link is active, and is lit when the SU has completed the Network Entry process.
- LEDs 2 to 9 (green) indicate the quality of the received signal. The higher the number of LEDs illuminating, the better the quality of the received signal.
- If all LEDs, including LED 10 (red) are on, the received signal strength is too high. This must be avoided, preferably by up-tilting the antenna. As a rule of thumb, if the SU is located at a distance of less than 300 meters from the Base Station, it is recommended to up-tilt the antenna by approximately 10° to 15°.

To align the antenna:

1. Point the antenna toward the general direction of the Base Station.
2. Connect the SAU to the ODU.
3. Verify that the PWR (power) indication on the SAU is on.
4. Verify that the WLNK (LED 1) indicator is on, indicating that the unit is synchronized with the Base Station. If the SU is not synchronized with the Base Station, ensure that all parameters are configured properly. If the unit is still not synchronized with the Base Station, improve the quality of the link by changing the direction of the antenna or by placing the antenna at a higher point or in an alternate location.
5. Rotate (and/or tilt if applicable) the ODU/antenna until the maximum link quality reading is achieved. If you encounter prolonged difficulty in achieving the expected link quality, try to improve the reception quality by placing the antenna at a higher point or in an alternate location.

NOTE

Ensure that the front of the antenna is always facing the Base Station. However, in certain conditions, such as when the line of sight to the Base Station is hampered, better reception may be achieved using a reflected signal. In this case, the antenna is not necessarily directed toward the Base Station.

6. Secure the ODU/antenna firmly to the pole.

8.3 Operation Verification

To verify proper operation of the SU, examine the LED indicators on the IDU (see Table 1-12) and the SAU (see Table 8-1 and Table 8-2).

NOTE

Verifying the correct operation of the ODU using the SAU LEDs is meaningful only after the configuration and alignment processes are completed, and the unit is synchronized with the Base Station.

To verify data connectivity, from the end-user's PC or from a portable PC connected to the unit, ping a known device in the network, or connect to the Internet.

9

Chapter 9 - Connecting to The Network and PC

In This Chapter:

- "Connecting to the Network" on page 64

9.1 Connecting to the Network

CAUTION

Do not connect the data equipment to the RADIO port. The RADIO port supplies DC power to the ODU, and this may harm other equipment connected to it.

To connect to the network:

1 Connect the 10/100 Base-T ETHERNET connector(s) to the data equipment. The cable connection should be a crossed Ethernet if connecting to a hub/switch and a straight cable if connecting directly to a PC Network Interface Card (NIC).

NOTE

The length of the Ethernet cable connecting CPE-IDU-1D to the user's equipment, together with the length of the IDU-ODU cable, should not exceed 100 meters.

2 Verify proper operation as described in the applicable section of Chapter 10.

10

Chapter 10 - Commissioning Procedure

In This Chapter:

- "Commissioning Steps" on page 66
- "Configuring Basic Parameters" on page 67
- "Fast Configuration and Antenna Alignment" on page 70
- "Operation Verification" on page 72

10.1 Commissioning Steps

After completing the installation process, as described in the preceding chapter, several actions should be performed to ensure connectivity with the Base Station and provisioning of services. After the SU is connected with the Base Station, it can be fully managed via the wireless link from the Base Station or a central management system:

1. The basic parameters must be configured to ensure that the unit operates correctly and can communicate with the Base Station.
2. The antenna must be aligned to ensure optimal performance of the wireless link.
3. Proper operation should be verified, including data connectivity.

10.2 Configuring Basic Parameters

10.2.1 The Basic Parameters

Table 10-1: SU's Basic Parameters

Parameter	Default Value	Comment
Ethernet Port auto Negotiation Enable/Disable	Enabled	Applicable only to E-model units (with Ethernet interface).
Ethernet Port Speed and Duplex		Applicable only to E-model units (with Ethernet interface). Applicable only if Ethernet Port Auto Negotiation Enable/Disable is set to Disable
User Name	Null, changed automatically to MAC address if not configured to any other value	Should be supplied by system administrator
User Password	quickynikynyoky	Should be supplied by system administrator
Organization Name		Optional - according to administrator policy
Address		Optional- according to administrator policy
Country		Optional- according to administrator policy
Best BST/AU Support	Enable	
BST/AU ID	186.190.0.0.250.206	
BST/AU ID ID Mask	0.0.0.0.0.0	
Preferred BST/AU ID	186.190.0.0.250.206	
Preferred BST/AU ID Mask	0.0.0.0.0.0	
Bandwidth	3.5 MHz	
Antenna (Si CPE only)	Automatic	
Scanning Start Frequency	Depend on Radio Band and Bandwidth	
Scanning End Frequency	Depend on Radio Band and Bandwidth	
Scanning Main Step	875 KHz for a 3.5 MHz Bandwidth.	

Table 10-1: SU's Basic Parameters

Parameter	Default Value	Comment
Scanning Intermediate Steps	Enable for all eight Steps	
Discrete Frequencies	None	
Rx Attenuator (2.3 GHz units only)	0	

NOTE

Some parameters are changed to their new values only after reset. Once the basic parameters are configured, the unit should be reset in order to activate the new configuration.

10.2.2 Configuration Tools

Two options for local configuration and monitoring are incorporated into the SU:

- The Installer Monitor program, based on a user-friendly CLI (Command Line Interface).
- The web Configuration Server, providing a web-based GUI.

You can configure the SU's parameters using any of the following:

- Using Telnet to access the Installer Monitor program.
- Using a PC/Notebook or a Pocket PC/PDA with a web browser to access the Web Configuration Server.

10.2.3 Using the Configuration Tools

To configure the SU's basic parameters:

1 To configure parameters using Telnet, connect a PC/Notebook to the Ethernet port of the IDU, using a straight Ethernet cable.

To configure parameters using the Web Configuration Server, connect a PC/Notebook or a Pocket PC/PDA with a web browser to the Ethernet port of the IDU, using a straight Ethernet cable.

You can also connect directly to the ODU's IDU COM, using the special Y cable.

2 Configure the PC's IP parameters to enable connectivity with the unit. The IP address of the SU for local management access is 192.168.254.251. The Subnet Mask is 255.255.255.0. The recommended IP address for the PC is 192.168.254.250, as this is also the default TFTP Sever IP Address (required for downloading SW versions and for downloading/uploading configuration files).

3 Run the Telnet program or open a web browser, and connect to 192.168.254.251. The Enter the password prompt is displayed. Enter the password and press the Enter key.

NOTE

The default password is "installer".

When using the Web Configuration Server, also enter the user name “installer”.

4 The Main menu of the SU Installer Monitor program/Web Configuration Server is displayed, enabling access to the required parameters configuration and performance monitoring options. Refer to the BreezeMAX CPEs Product Manual for instructions on using the SU Installer Monitor program and detailed information on the various parameters and other features supported by the program.

5 Configure the basic parameters listed in Table 10-1.

6 Reset the unit to apply the new settings and enable synchronization with the Base Station.

10.3 Fast Configuration and Antenna Alignment

A special Y-cable, available from Alvarion, enables to connect a Pocket PC (or a portable PC) directly to the IDU COM port of the ODU. This enables the installer to perform the entire process of configuring basic parameters, aligning the antenna and verifying proper operation of the unit right after completing the installation, minimizing the number of times the installer must climb to the roof.

To use a Pocket PC/Notebook for completing the entire installation process on the roof:

1. Disconnect the IDU-ODU cable from the ODU.
2. Connect the Y-cable according to the following drawing:

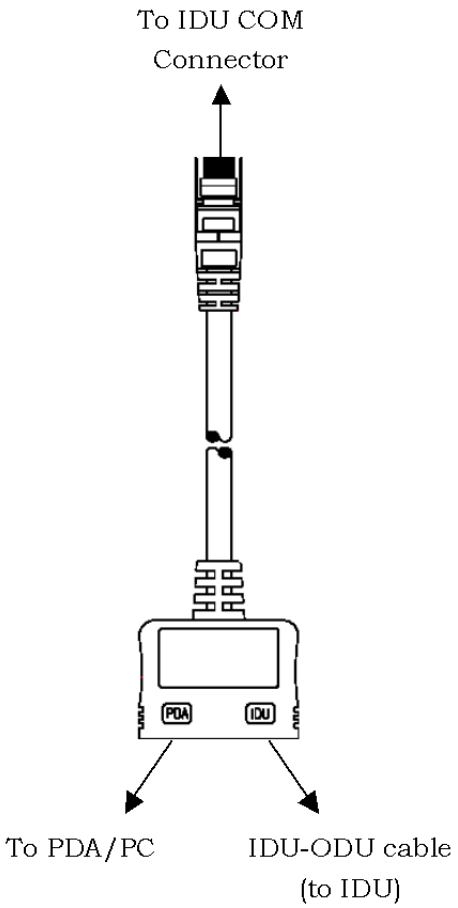


Figure 10-1: Connecting the Y-Cable

3 From the Pocket PC/Notebook, connect to the SU and complete the process of configuring basic parameters.

4 Verify that the the unit is synchronized with a Base Station. If the SU is not synchronized with a Base Station, ensure that all parameters are configured properly. If the unit is still not synchronized with a Base Station, improve the quality of the link by changing the direction of the antenna or by placing the antenna at a higher or in an alternate location.

5 Rotate (and/or tilt if applicable) the ODU/antenna until the maximum link quality (SNR and RSSI) reading is achieved. If you encounter prolonged difficulty in achieving the expected link quality, try to improve the reception quality by placing the antenna at a higher point or in an alternate location.

NOTE

Ensure that the front of the antenna is always facing the Base Station. However, in certain conditions, such as when the line of sight to the Base Station is hampered, better reception may be achieved using a reflected signal. In this case, the antenna is not necessarily directed toward the Base Station.

6 Secure the ODU/antenna firmly to the pole.

CAUTION

In some cases, the antenna may need to be tilted to ensure that the level at which the SU receives transmissions from the AU (and vice versa) is not too high. When the RSSI reading is higher than 20 dBm, the received signal level is too high (saturation). This must be avoided, preferably by up tilting the antenna. As a rule of thumb, if the SU is located at a distance of less than 300 meters from the AU, it is recommended to up-tilt the antenna by approximately 10° to 15°.

7 Isolate the connector to protect against moisture and humidity (refer to Section 6.4 and Table 3-3).

10.4 Operation Verification

To verify proper operation of the SU, examine the LED indicators on the IDU (see Table 1-12) and the SAU (see Table 8-1 and Table 8-2).

NOTE

Verifying the correct operation of the ODU using the SAU LEDs is meaningful only after the configuration and alignment processes are completed, and the unit is synchronized with the Base Station.

To verify data connectivity, from the end-user's PC or from a portable PC connected to the unit, ping a known device in the network, or connect to the Internet.

11

Chapter 11 - Maintenance and Troubleshooting

In This Chapter:

- “ODU and Antenna Maintenance” on page 74
- “Troubleshooting” on page 75

11.1 ODU and Antenna Maintenance

Once a year, before the rain season, it is strongly recommended to check that the sealing of all outdoor connectors is intact and that the ODU and antenna are secure and undamaged.

11.2 Troubleshooting

Refer to the BreezeMAX Troubleshooting Guide for troubleshooting some of the more common problems which may occur when using the BreezeMAX PRO-S CPE. Follow the instructions provided in the Corrective Action column. The more common solutions are listed first. Proceed to the next item on the list if the proposed solution did not solve the problem.

The Troubleshooting Guide can be downloaded from the Alvarion web site, www.alvarion.com.

A

Appendix A - CPE Site Report

In This Chapter:

This Chapter provides a recommended CPE site report format to be filled out by the installer.

General Information:

Site Name			
Site Address			
Contact Person			
Telephone			
Installation Type	☐ Line Of Sight (LOS)	☐ Near LOS	☐ Non LOS
Distance from BS (Km)		UTM Co-ordinates	
Azimuth (°)		Site Height (m)	
Mast Height (m)		Mast Diameter (Inches)	
Altitude Above Sea Level (m)		Cable Length (m)	
Antenna Type (add P/N) *			

* SE Model only

Installation Type:

The Installation Type information relates to the Installation Type in the General Information Table above.

For optimal system performance, line of site testing must include the mapping of obstacles, such as Buildings, Hills, Trees, Antennas/mast, etc.

Photo Number	Description	Possibilities For Interface
1.		
2.		
3.		

Service And Connectivity:

Connected BST ID	
DL SNR (dB)	
DL RSSI (dBm)	
Oprimal Rx Rate	
Last Tx Rate	
UL SNR (dB)	
DL RSSI (dBm)	

General Comments:

Name	Date	Signature

Glossary

ARQ	Automatic Repeat reQuest. A communication technique in which the receiving device detects errors and requests retransmissions.
ATPC	Automatic Transmit Power Control
AU	Access Unit
BE	Best effort. A service where neither throughput nor delay guarantees are provided. The subscriber unit sends requests for bandwidth in either random access slots or dedicated transmission opportunities. The occurrence of dedicated opportunities is subject to network load, and the subscriber unit cannot rely on their presence. Service parameters include Committed Time (CT) and Maximum Information Rate (MIR).
BPSK	Binary Phase-Shift Keying. A data transfer technique. BPSK transmits data using two phase modulation signals, one phase representing a binary one, and the other representing a binary zero. The signal is divided into bits; their status is determined by the preceding wave. If the wave changes, for example, the signal is reversed.
BST	Base Station
BWA	Broadband Wireless Access
CF	Compact Flash. A popular memory card that uses flash memory to store data on a very small card.
CG	Continuous Grant. Also known as Unsolicited Grant Services (UGS), is tailored for carrying constant bit- rate (CBR) real-time services characterized by fixed size data packets on a periodic basis such as VoIP or E1/T1. Service parameters include unsolicited grant size (packet size) and normal grant interval (sample interval).
CIR	Committed Information Rate. The rate (in bits per second) at which a network guarantees to transfer information under normal conditions, averaged over a minimum increment of time.

CLI	Command Line Interface. A user interface where the user sees the command line on the monitor and a prompt that is waiting to accept instructions from the user. The user types in the command, the computer acts on that command and then issues a new prompt for the next instruction from the user.
CPE	Customer Premise Equipment. Communications equipment that resides on the customer's premises.
CPU	Central Processing Unit
CRC	Cyclical Redundancy Check. A common technique for detecting data transmission errors, in which the frame recipient calculates a remainder by dividing frame contents by a prime binary divisor and compares the calculated remainder to a value stored in the frame by the sending equipment.
CSMA/CD	Carrier Sense Multiple Access with Collision Detection. Media-access mechanisms wherein devices ready to transmit data first check the channel for a carrier. If no carrier is sensed for a specific period of time, a device can transmit. If two devices transmit at once, a collision occurs and is detected by all colliding devices. This collision subsequently delays retransmissions from those devices for some random length of time. Ethernet and IEEE 802.3 use CSMA/CD access.
CT	Committed Time. The time interval used for measuring average information transfer rates.
DHCP	Dynamic Host Configuration Protocol. A protocol for dynamically assigning IP addresses from a pre-defined list to nodes on a network. Using DHCP to manage IP addresses simplifies client configuration and efficiently utilizes IP addresses.
DL	Down Link
DRAP	Dynamic Resources Allocation Protocol
EMC	Electro-Magnetic Compatibility. The capability of equipment or systems to be used in their intended environment within designed efficiency levels without causing or receiving degradation due to unintentional EMI (Electro Magnetic Interference). EMC generally encompasses all of the electromagnetic disciplines.

ETSI	European Telecommunications Standards Institute. A non-profit organization producing voluntary telecommunications standards used throughout Europe, some of which have been adopted by the EC as the technical base for Directives or Regulations.
FCC	Federal Communications Commission. A U.S. government agency that supervises, licenses, and controls electronic and electromagnetic transmission standards.
FDD	Frequency Division Duplex. Full duplex operation by using a pair of frequencies, one for transmission and one for reception.
FEC	Forward Error Correction. A method of communicating data that can corrects errors in transmission on the receiving end. Prior to transmission, the data is put through a predetermined algorithm that adds extra bits specifically for error correction to any character or code block. If the transmission is received in error, the correction bits are used to check and repair the data.
FFT	Fast Fourier Transform. An algorithm for converting data from the time domain to the frequency domain; often used in signal processing.
FTP	File Transfer Protocol. A protocol for exchanging files over the Internet. FTP uses the Internet's TCP/IP protocols to enable data transfer.
GUI	Graphical User Interface. In a GUI operating system, the user responds to graphic images on the screen instead of typing in commands in response to a prompt.
H.323	A protocol suite defined by ITU-T for voice transmission over internet (Voice over IP or VoIP). In addition to voice applications, H.323 provides mechanisms for video communication and data collaboration, in combination with the ITU-T T.120 series standards.
HTTP	HyperText Transfer Protocol. The protocol used to transmit and receive all data over the World Wide Web.
IDU	Indoor Unit

IEEE	Institute of Electrical and Electronics Engineers. IEEE (pronounced I-triple-E) is an organization composed of engineers, scientists, and students. The IEEE is best known for developing standards for the computer and electronics industry. In particular, the IEEE 802 standards for local-area networks are widely followed.
IEEE 802.3	A Local Area Network protocol suite commonly known as Ethernet. Ethernet uses Carrier Sense Multiple Access bus with Collision Detection CSMA/CD. This method allows users to share the network cable. However, only one station can use the cable at a time. A variety of physical medium dependent protocols are supported.
IEEE 802.11b	The IEEE 802.11b (also referred to as 802.11 High Rate or Wi-Fi). An extension to 802.11 standard for wireless Ethernet networks, that applies to wireless LANS and provides 11 Mbps transmission (with a fallback to 5.5, 2 and 1 Mbps) in the 2.4 GHz band.
IEEE 802.11g	An extension to 802.11 standard for wireless Ethernet networks, that applies to wireless LANs and provides 20+ Mbps in the 2.4 GHz band.
IP	Internet Protocol. The standard that defines how data is transmitted over the Internet. IP bundles data, including e-mail, faxes, voice calls and messages, and other types, into "packets", in order to transmit it over public and private networks.
LAN	Local area Network. A computer network limited to a small geographical area, such as a single building. The network typically links PCs as well as shared resources such as printers.
LED	Light Emitting Diode.
MAC Address	Standardized data link layer address that is required for every port or device that connects to a LAN. Other devices in the network use these addresses to locate specific ports in the network and to create and update routing tables and data structures. MAC addresses are 6bytes long and are controlled by the IEEE.

MIR	Maximum Information Rate. Specifies the maximum rate of information that can be available to a user. The MIR is used by the traffic policing mechanism to prevent users from sending excess traffic to the network.
NA	Not Available or Not Applicable
NAT	Network Address Translation. Basic Network Address Translation (Basic NAT) is a method by which IP addresses are mapped from one group to another, transparent to end users. Network Address Port Translation, or NAPT is a method by which many network addresses and their TCP/UDP ports are translated into a single network address and its TCP/UDP ports. Together, these two operations, referred to as traditional NAT, provide a mechanism to connect a realm with private addresses to an external realm with globally unique registered addresses.
NIC	Network Interface Card. An expansion board you insert into a computer (or a built-in component) that enables the computer to connect to a network. Most NICs are designed for a particular type of network, protocol, and media, although some can serve multiple networks.
NPU	Network Processing Unit
NRT	Non Real Time. is very similar to the Real-Time polling service except that connections may utilize random access transmit opportunities for sending bandwidth requests. These Non Real Time Variable Bit Rate (NRT-VBR) services, such as file transfer and Internet access with a minimum guaranteed rate, are characterized by requirement for a guaranteed rate, but can tolerate longer delays and are rather insensitive to jitter. Service parameters include CIR, Committed Time (CT), and MIR that limit the rate as otherwise bandwidth intensive services may expand to occupy full bandwidth.
ODU	Outdoor Unit
OFDM	Orthogonal Frequency Division Multiplexing: A method for multiplexing signals, which divides the available bandwidth into a series of frequencies known as tones. Orthogonal tones do not interfere with each other when the peak of one tone corresponds with the null. The rapid switching, frequency-hopping technique is intended to allow more robust data service.

PDA	Personal Digital Assistant. A handheld computing device.
PER	Packet Error Rate. In a digital transmission, PER is the percentage of packets with errors divided by the total number of packets that have been transmitted, received or processed over a given time period.
PHY	PHYsical Layer. The physical, or lowest, layer of the OSI Network Model. In a wireless network, the PHY defines parameters such as data rates, modulation method, signaling parameters, transmitter/receiver synchronization, etc. Within an actual radio implementation, the PHY corresponds to the radio front end and baseband signal processing sections.
POTS	Plain Old Telephone System. A basic analog telephone equipment.
PPPoE	Point-to-Point Protocol over Ethernet. PPPoE relies on two widely accepted standards: PPP and Ethernet. PPPoE is a specification for connecting the users on an Ethernet to the Internet through a common broadband medium, such as a single DSL line, wireless device or cable modem. All the users over the Ethernet share a common connection, so the Ethernet principles supporting multiple users in a LAN combines with the principles of PPP, which apply to serial connections.
QAM	Quadrature Amplitude Modulation. A technique used in wireless applications to double the available bandwidth by combining two amplitude-modulated signals. The two combined signals differ in phase by 90 degrees; this technique doubles the bandwidth by combining the two signals at the source before transmission, transmitting digital data at a rate of 4 bits per signal change.
QoS	Quality of Service. Measure of performance for a transmission system that reflects its transmission quality and service availability.
QPSK	Quadrature Phase Shift Keying. A data transfer technique used in coaxial cable networks that sends data using modulating signals. Four different phases represent data, with each signal's information determined by the signal before it. For example, if a phase stays the same from one signal to the other, the information has not changed.
RF	Radio frequency. An AC signal of high enough frequency to be used for wireless communications.

RSSI	Received Signal Strength Indicator. A signal or circuit that indicates the strength of the incoming (received) signal in a receiver.
R&TTE	Radio & Telecommunications Terminal Equipment. The R&TTE Directive 1999/5/EC governs the marketing and use of R&TTE equipment. With the exception of a few categories of equipment, the Directive covers all equipment, which uses the radio frequency spectrum. It also covers all terminal equipment attached to public telecommunication networks.
RT	Real Time. Real Time service is designed to meet the needs of Real Time Variable Bit Rate (RT-VBR) like services characterized by requirements for guaranteed rate and delay such as streaming video or audio. These services are dynamic in nature, but offer periodic dedicated requests opportunities to meet real-time requirements. Because the subscriber equipment issues explicit requests, the protocol overhead and latency is increased, but capacity is granted only according to the real needs of the connection. Service parameters include CIR and CT.
Rx	Receive
SAU	SU Alignment Unit
SIP	Session Initiation Protocol. An application-layer control IETF protocol that can establish, modify, and terminate multimedia sessions such as Internet telephony calls (VoIP). SIP can also invite participants to already existing sessions, such as multicast conferences. Media can be added to (and removed from) an existing session. SIP transparently supports name mapping and redirection services, which supports personal mobility - users can maintain a single externally visible identifier regardless of their network location.
SNMP	Simple Network Management Protocol. A network management protocol that provides a means to monitor and control network devices, and to manage configurations, statistics collection, performance, and security. SNMP works by sending messages, called protocol data units (PDUs), to different parts of a network. SNMP-compliant devices, called agents, store data about themselves in Management Information Bases (MIBs) and return this data to the SNMP requesters.

SNR	Signal to Noise Ratio. The ratio of the amplitude of a desired analog or digital data signal to the amplitude of noise in a transmission channel at a specific point in time. SNR is typically expressed logarithmically in decibels (dB). SNR measures the quality of a transmission channel or a signal over a network channel. The greater the ratio, the easier it is to identify and subsequently isolate and eliminate the effects of noise. SNR also is abbreviated as S/N.
SU	Subscriber Unit
TCP	Transmission Control Protocol. Connection-oriented transport layer protocol that provides reliable full-duplex data transmission. TCP is the part of the TCP/IP suite of protocols that is responsible for forming data connections between nodes that are reliable, as opposed to IP, which is connectionless and unreliable.
TCP/IP	Transmission Control Protocol/Internet Protocol. A set of protocols developed by the U.S. Department of Defense to allow communication between dissimilar networks and systems over long distances. TCP/IP is the de facto standard for data transmission over networks, including the Internet.
TDD	Time Division Duplex is a duplexing technique dividing a radio channel in time to allow downlink operation during part of the frame period and uplink operation in the remainder of the frame period.
TFTP	Trivial File Transfer Protocol. Simplified version of FTP that allows files to be transferred from one computer to another over a network, usually without the use of client authentication.
Tx	Transmit
BST	Micro Base Station
UDP	User Datagram Protocol. Connectionless transport layer protocol in the TCP/IP protocol stack. UDP is a simple protocol that exchanges datagrams without acknowledgments or guaranteed delivery, requiring that error processing and retransmission be handled by other protocols. UDP is defined in RFC 768.
UL	Up Link

VLAN	Virtual Local Area Network. A group of devices on one or more LANs that are configured with the same VLAN ID so that they can communicate as if they were attached to the same wire, when in fact they are located on a number of different LAN segments. Used also to create separation between different user groups.
VoIP	Voice over Internet Protocol. Provides an advanced digital communications network that bypasses the traditional public switched telephone system and uses the Internet to transmit voice communication. VoIP enables people to use the Internet as the transmission medium for telephone calls by sending voice data in packets using IP rather than by traditional circuit switched transmissions of the PSTN.
WEEE	Waste Electronic and Electrical Equipment. The purpose of Directive 2002/96/EC on waste electrical and electronic equipment (WEEE) is, as a first priority, the prevention of waste electrical and electronic equipment (WEEE), and in addition, the reuse, recycling and other forms of recovery of such wastes so as to reduce the disposal of waste. It also seeks to improve the environmental performance of all operators involved in the life cycle of electrical and electronic equipment, e.g. producers, distributors and consumers and in particular those operators directly involved in the treatment of waste electrical and electronic equipment.
WL (or W/L)	Wireless LAN
WIMAX	The name commonly given to the IEEE 802.16 standard. Specifications for fixed broadband wireless metropolitan access networks (MANs) that use a point-to-multipoint architecture. WIMAX supports very high bit rates in both uploading to and downloading from a base station up to a distance of 30 miles.